

9. The collagen material according to claim 2, wherein said collagen material has one-point support tensile force of at least 30 N and rupture resistance tensile force of at least 65 N in the dry state, and has one-point support tensile force of at least 1.4 N and rupture resistance tensile force of at least 6.5 N in the wet state.

**REMARKS**

Claims 1-3, 5 and 7-10 are pending in the subject application. Claims 1, 2, 3 and 9 have been amended for clarification purposes and for purposes. Support for the amendment to claims 1, 2, 3 and 9 is found throughout the Specification, as filed (eg. see page 22, lines 12-22), and no new matter is presented by the amendment.

Applicants submit herewith a copy of United Stated Patent No. 6,277,397, which is an English translation of the cited reference Yasuhiko, WO 98/22157, for the Office's consideration.

Favorable reconsideration in light of the amendments and remarks, which follow, is respectfully requested.

1. Claim Objections

Claims 1 and 9 have been objected to because of the following informalities: In claim 1, on line 5, the word "fiber" is misspelled. A period is missing from the end of the sentence. In claim 9, line 2, the word "collagen" is misspelled.

Claims 1 and 9 have been amended to correct these typographical errors. Reconsideration and withdrawal of the objections is respectfully requested.

2. 35 U.S.C. §112 Rejections

Claims 1-3, 5, 7, 8, 9 and 10 have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite. The Office states:

Claim 1 recites on lines 2 and 3 "a collagen material which is filled or had inside a substance having biocompatibility that can be degraded and absorbed in the body into a matrix of non-woven fabric-like multi-element structure of collagen fibers". The Examiner is unsure how to interpret the phrase. Is the collagen material absorbed into a matrix of

collagen fibers? Is the collagen material made of the collagen fibers? Is the collagen material the substance having biocompatibility?

Applicants respectfully submit that the amendments made herein overcome this rejection.

Specifically, regarding the Examiner's question "Is the collagen material absorbed into a matrix of collagen fibers?" Applicants respectfully submit that the collagen material is not absorbed into a matrix of collagen fibers. Rather, fibrous collagen fibers or a substance selected from the group consisting of polyglycolic acid, polylactic acid, copolymer of glycolic acid and lactic acid, polydioxanone, copolymer of glycolic acid and trimethylene carbonate, and a mixture of polyglycolic acid and polylactic acid, is filled into a matrix of collagen fibers.

Regarding the Examiner's question "Is the collagen material made of the collagen fibers?" Applicants respectfully submit that the answer to this question depends on the substance filled into the matrix. If the substance is fibrous collagen fiber, then the answer is yes. If the substance is another biocompatible substance such as polyglycolic acid, then the answer is no.

Regarding the Examiner's question "Is the collagen material the substance having biocompatibility?" Applicants respectfully submit that scientifically, the collagen material of the invention has biocompatibility. However, according to claim 1, the collagen material consists of a matrix filled with a substance having biocompatibility. Thus, the substance having biocompatibility is a portion of the collagen material but is not itself the collagen material.

The Office further states "Claim 1 recites on lines 3 and 4 that the non-woven is 'fabric-like'. How does it resemble a fabric?" Applicants respectfully submit that the matrix resembles a non-woven fabric in its structure.

The Office further states "In claim 1, lines 5, 6, 7, 9 and 10, it is unclear what is meant by 'composed of that in which'." Applicants respectfully submit that this terminology has been amended accordingly.

The Office further states "Claim 1 recites on line 5 that the collagen fibers are 'plate-like'. Are they flat in shape resembling a plate?" Applicants respectfully submit that "plate-like" refers to element 11 in Figure 1. The shape of element 11 is a spindle shape and has a flat part, which is not clearly depicted in the figure. Thus, the fibers could be described as "spindle shaped fibers" or, as used in the cited reference, "plate fibers". Claim 1 has been amended accordingly.

The Office further states that "Claim 1 recites on line 7 that the fibers overlap in the 'coaxial direction'. What direction is the coaxial direction?" Applicants respectfully submit that "coaxial direction" is a term known to one skilled in the art and means that the longitudinal direction of collagen fibers having a diameter of 5-8  $\mu\text{m}$  is the same as the longitudinal direction of plate fibers (see Fig. 1, elements 11 and 12).

### 3. 35 U.S.C. §102 Rejections

Claims 1-3, 5 and 7 have been rejected under 35 U.S.C. §102(b) as being anticipated by Yasuhiko (WO 98/22157) The Office asserts that:

As to claims 1 and 8, Yasuhiko teaches a collagen material made of ultra-fine fibers having a diameter of about 5 nm. The ultra-fine fibers form microfibers having diameters of about 50 nm. The microfibers form fine fibers of about 2  $\mu\text{m}$  diameter. The fine fibers are laid alternately as warp and weft threads to form fiber of a diameter of about 6  $\mu\text{m}$ s, which are laid on each other in a coaxial direction to form disc-shaped fibers of 20 – 50  $\mu\text{m}$  in diameter. The disc-shaped fibers form the ultra-fine fibrous nonwoven collagen fabric multi-layered structure. On the outside of the structure are non-fibrillated collagen layers wherein collagen molecules are dispersed as monomers. (page 5, "Optimal form for implementing the invention").

Applicants respectfully traverse.

Applicants claim, in amended claim 1, a collagen material consisting of a matrix of a non-woven fabric-like multi-element structure of collagen fibers having ultra-fine

fibers of collagen as its basic unit, wherein the matrix is filled with a substance having biocompatibility that can be degraded and absorbed in the body. According to claim 1, the substance having biocompatibility is fibrous collagen fiber or a substance selected from the group consisting of polyglycolic acid, polylactic acid, copolymer of glycolic acid and lactic acid, polydioxanone, copolymer of glycolic acid and trimethylene carbonate, and a mixture of polyglycolic acid and polylactic acid. Further, the non-woven fabric-like multi-element structure of collagen fibers is composed of collagen plate fibers having a diameter of 20-50  $\mu\text{m}$  randomly intertwined. The plate fibers are composed of collagen fibers having a diameter of 5-8  $\mu\text{m}$ , wherein the collagen fibers overlap in the coaxial direction. The fibers are composed of bundled rows of narrow collagen fibers having a diameter of 1-3  $\mu\text{m}$  alternately overlapping as warp and weft. The narrow fibers are composed of bundled fine collagen fibers having a diameter of 30-70 nm. The fine fibers are composed of ultra-fine collagen fibers having a diameter of 3-7 nm that are comprised of several bundled collagen molecules.

Applicants' collagen material provides advantages over the prior materials in that it possesses physical properties that allow suturing while still maintaining the biochemical properties inherently possessed by collagen, and in that it retains its shape for a certain period of time after application to the body. Applicants' collagen material can be used as alternative medical membranes and present no ethical problems, can be produced in a stable supply, prevent adhesion of the surgical wound following surgery, present no risk of infection, do not cause tissue degeneration, allow a controllable rate of degeneration following application, and promote regeneration of biomembranes.

Yasuhiko, on the other hand, describes non-fibrous collagen layers in which collagen molecules are dispersed, in the form of monomers and oligomers, on the outside of the nonwoven collagen fabric multi-layered structure. Further, according to Yasuhiko, collagen molecules are also incorporated between the plate fibers of the nonwoven collagen fabric multi-layered structure. (Col. 4, lines 48-55 of US 6,277,397).

Thus, Yasuhiko does not describe or suggest a matrix of collagen fibers filled with a biocompatible substance. Rather, Yasuhiko describes that the outside of a non-woven fabric-like multi-layer structure (10) is surrounded by non-fibrous collagen layers (20a and 20b) (See Fig. 1; col. 4, lines 48-55 of US 6,277,397). Further, Yasuhiko does not describe or suggest that the collagen filled onto the matrix comprises fibrous collagen layers are required by Applicants' claims. Rather, Yasuhiko requires that the collagen filled onto the matrix is non-fibrous (see e.g. Abstract, line 4; col. 1, line 19; col. 3, lines 62-63; col. 4, lines 48-50).

As provided in MPEP-2131, a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegal Bros. v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Or stated another way, "The identical invention must be shown in as complete detail as is contained in the ... claims. *Richardson v Suzuki Motor Co.*, 868 F.2d 1226, 9 USPQ 2d. 1913, 1920 (Fed. Cir. 1989). Although identify of terminology is not required, the elements must be arranged as required by the claim. *In re Bond*, 15 USPQ2d 1566 (Fed. Cir. 1990).

It is clear from the foregoing remarks that claim 1 is not anticipated by the Yasuhiko reference. As set out, Yasuhiko does not set forth each and every element required by Applicants' claim 1. Further, claims 2-3, 5 and 7-10 depend from claim 1 and, likewise, are not anticipated by Yasuhiko.

Further, claim 1 would not be obvious in view of Yasuhiko. To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the

prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). MPEP 2142.

As set forth above, each and every element of Applicants' claim 1 is not taught or suggested by Yasuhiko. Further, there is no suggestion or motivation in the reference of to one of ordinary skill in the art to modify Yasuhiko as required by Applicants' claim 1. Rather, this suggestion and motivation comes purely from Applicant. Accordingly, claim 1 is patentable over Yasuhiko. Claims 2-3, 5 and 7-10 depend from claim 1 and, likewise, are patentable over Yasuhiko.

Regarding the Offices' assertion that "As to claims 2 and 7, Yasuhiko teaches that the substance is formed by freezing and freeze-drying procedure to a hydrochloric acid solution extracted from collagen (page 7, 2<sup>nd</sup> paragraph)", Applicants respectfully disagree. As set out in claims 2 and 7, the matrix, which is a fibrous collagen fiber containing ultra-fine fibers of collagen, is formed by performing a freezing and freeze-drying procedure to a hydrochloric acid solution of extracted collagen introduced into the matrix. According to Yasuhiko, the freezing and freeze-drying procedure is not applied to the non-fibrous collagen layers (20a and 20b), but, rather, is applied only to produce the non-woven fabric-like multi-layer structure (10). Further, according to claim 7, the substance having biocompatibility is filled into the matrix. The substance is "filled into" the matrix by, for example, allowing it to seep in under reduced pressure (see page 19, lines 26-29; page 14, lines 1-10, step j). According to Yasuhiko, on the other hand, when the non-woven fabric-multi-layer structure is formed, a sheet-like mesh intermediate is left immersed in a collagen hydrochloric acid solution (col. 10, lines 32-39) and, thus, the collagen hydrochloric acid solution does not penetrate into the sheet-like mesh intermediate as required by claim 7.

Regarding the Offices' assertion that "As to claims 3 and 5, Yasuhiko teaches that the substance can be a sheet of mesh-like material containing degradable and absorbable materials such as copolymers of polyglycolic acid and lactic acid (page 11, 3<sup>rd</sup> paragraph)", Applicants respectfully disagree. According to claim 5, as with claim

7 described above, the substance having biocompatibility must be filled into the matrix. Yasuhiko does not describe or suggest this.

Further, claim 8, like claims 5 and 7 described above, require that the substance having biocompatibility is filled into the matrix. Yasuhiko does not describe or suggest this.

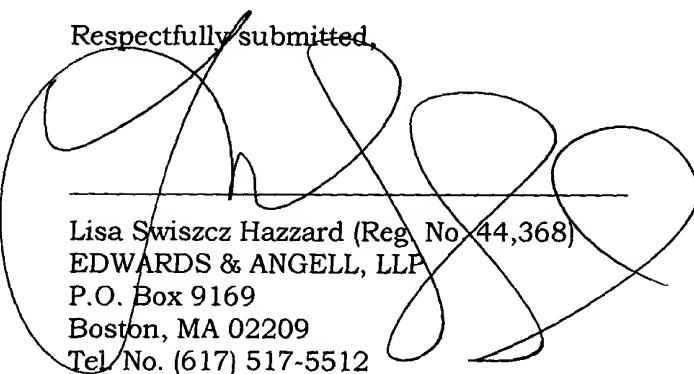
For the reasons set out above, Applicants respectfully submit that claims 1-3, 5 and 7-10 are patentable over Yasuhiko. Reconsideration and withdrawal of the rejection is respectfully requested.

#### CONCLUSION

Reconsideration and allowance of claims 1-3, 5 and 7-10 is respectfully requested in view of the foregoing discussion. This case is believed to be in condition for immediate allowance. Applicants respectfully requests early consideration and allowance of the subject application.

Applicants conditionally petition for an extension of time to provide for the possibility that such a petition has been inadvertently overlooked and is required. As provided below charge Deposit Account No. **04-1105** for any required fee.

Should the Examiner wish to discuss any of the amendments and/or remarks made herein, the undersigned attorney would appreciate the opportunity to do so.

Respectfully submitted,  
  
Lisa Swiszcz Hazzard (Reg. No. 44,368)  
EDWARDS & ANGELL, LLP  
P.O. Box 9169  
Boston, MA 02209  
Tel. No. (617) 517-5512



RECEIVED  
JUL 17 2003  
GROUP 1700

**VERSION WITH MARKINGS TO SHOW CHANGES MADE IN CLAIMS**

Please note that additions to the claims are shown underlined and deletions are shown in brackets.

**Please amend claims 1, 2, 3 and as follows:**

1. A collagen material consisting of [which is filled or had inside a substance having biocompatibility that can be degraded and absorbed in the body into] a matrix of a non-woven fabric-like multi-element structure of collagen fibers having ultra-fine fibers of collagen as its basic unit,

the matrix being filled with a substance having biocompatibility that can be degraded and absorbed in the body,

wherein said substance having biocompatibility that can be degraded and absorbed in the body is fibrous collagen fiber or a substance selected from the group consisting of polyglycolic acid, polylactic acid, copolymer of glycolic acid and lactic acid, polydioxanone, copolymer of glycolic acid and trimethylene carbonate, and a mixture of polyglycolic acid and polylactic acid,

wherein said non-woven fabric-like multi-element structure of collagen fibers is composed of [that in which] collagen[plate-like fivers] plate fibers having a diameter of 20-50  $\mu\text{m}$  [are] randomly intertwined,

said plate[-like] fibers are composed of [that in which] collagen fibers having a diameter of 5-8  $\mu\text{m}$ , wherein the collagen fibers overlap in the coaxial direction,

said fibers are composed of [that in which] bundled rows of narrow collagen fibers having a diameter of 1-3  $\mu\text{m}$  [are] alternately overlapping as warp and weft,

said narrow fibers are composed of [that in which] bundled fine collagen fibers having a diameter of 30-70 nm [are bundled], and

said fine fibers are composed of [that in which] ultra-fine collagen fibers having a diameter of 3-7 nm that are comprised of several bundled collagen molecules [are bundled].

2. The collagen material according to claim 1, wherein said substance having biocompatibility that can be degraded and absorbed in the body and being filled into said matrix is fibrous collagen fiber containing ultra-fine fibers of collagen newly formed by performing a freezing and freeze-drying procedure to a hydrochloric acid solution of extracted collagen introduced into said matrix.

3. The collagen material according to claim 1, wherein said substance having biocompatibility that can be degraded and absorbed in the body and being [contained inside] filled into said matrix is selected from the group consisting of polyglycolic acid, polylactic acid, copolymer of glycolic acid and lactic acid, polydioxanone, copolymer of glycolic acid and trimethylene carbonate, and a mixture of polyglycolic acid and polylactic acid, and is used as a mesh-like sheet or tube, or a non-woven fabric-like sheet or tube.

9. The collagen material according to claim 2, wherein said [collagen] collagen material has one-point support tensile force of at least 30 N and rupture resistance tensile force of at least 65 N in the dry state, and has one-point support tensile force of at least 1.4 N and rupture resistance tensile force of at least 6.5 N in the wet state (for a thickness of 1 mm).